## 2.2 ENVIRONMENTAL CONTEXT

Northern Arizona is generally a rural region of the State with an abundance of environmentally sensitive areas and recreational amenities. This region is characterized by public lands, such as wilderness areas, national forests, national parks, and the highest point in the state, Mount Humprey's (12,633 feet).

Environmental elements compiled within the study area include geology and topography, hydrology, natural resources, cultural resources, air quality, and hazardous materials. The environmental elements outlined below are based on readily available information that has not been field verified. This information was obtained from various sources such as public agencies, municipalities, internet, and available databases based on Geographic Information Systems (GIS). On-site "ground truthing" and field investigation are recommended at the Corridor Improvement Study and Design Concept Report levels to verify these environmental considerations.

### 2.2.1 Geology and Topography

#### Coconino-Yavapai Focus Area

The Coconino-Yavapai Focus Area includes the northern two-thirds of Yavapai County and most of Coconino County, Arizona. This area covers almost 10% of the State of Arizona, and consists of extremely diverse terrain. Major geologic features include the southwestern part of the Colorado Plateau, the Grand Canyon, the San Francisco Peaks, and the western reaches of the Mogollon Rim.

This Focus Area includes parts of the Basin and Range physiographic province and the western end of the Colorado Plateau physiographic province. The Basin and Range province extends through the intermountain western United States, and is characterized by landforms of long, linear mountain ranges separated by long valleys. The Colorado Plateau province consists of relatively horizontal sedimentary formations that have been uplifted and have deeply incised drainages and canyons. The mountainous features of the Basin and Range are evident in the Yavapai County portion of the Focus Area, and the geologic features are the result of extensional tectonic forces, which resulted in normal faulting with downthrown blocks (valleys) and upthrust mountain ranges. In Arizona, the Basin and Range physiographic province bends to a northwest – southeast trend due to the narrowing of the North American continent to the south. These tectonic forces are illustrated by the northwest to southeast trending normal faults that exist in this Focus Area. North of I-40 the terrain reflects the flat mesas of the Colorado Plateau, punctuated by tertiary volcanics such as the San Francisco Peaks.

Geologically, the Mogollon Rim provides a rough boundary between the two physiographic provinces. Above the rim, the flat mesas of generally Mesozoic sedimentary rocks can form imposing buttes and dramatic valleys. The Grand Canyon is the best manifestation of the geologic forces at play in the Colorado Plateau. Thousands of vertical feet of sedimentary rock is visible in the canyon, and provides an "open book" of approximately 1.5 billion years of geologic time. Below the rim, Oak Creek and other tributaries form the Verde River Valley, which is bounded to the south by the Black Hills. This region is punctuated by Mesozoic granite uplifts, tertiary volcanic basalt flows, and colorful sedimentary rock units. The sedimentary units vary in age depending upon the location – some are older deposits that were deformed by uplift or metamorphism, while others were more recently deposited by erosional forces from the uplifted mountain ranges.

Mining has historically occurred in the area, including metals from the Jerome area mines, cinders from the various volcanic cones, and decorative stone such as flagstone and granite from multiple locations.

Hydrogeologically, the major surface drainages in the area include the Colorado River system and its tributaries (in most of Coconino County), and the Verde River system (south of the Mogollon Rim). Groundwater in the study area is widely variable in depth-to-water, yield capacity, and water quality, and is largely dependent upon local geology and infiltration by seasonal rainfall.

### Navajo-Hopi Focus Area

The Navajo-Hopi Focus Area includes approximately the northern two-thirds of Navajo and Apache Counties, Arizona. This area covers almost 8% of the State of Arizona, and consists of high plateaus with occasionally mountainous terrain.

The Focus Area is located entirely within the Colorado Plateau physiographic province. The Colorado Plateau province consists of relatively horizontal sedimentary formations that have been uplifted and have deeply incised drainages and canyons. The mountainous features within this Focus Area include the Carrizo and Chuska Mountains, which consist of a series of stairstep-style resistant Jurassic sedimentary formations. The large, flat mesas of this Focus Area are punctuated by deep, incised drainages and slot canyons, many with only ephemeral streams. On the mesa tops, Aeolian deposits are common, with alkaline flat areas where rainfall is captured in closed basins.

Geologically, the area consists almost entirely of Mesozoic (primarily Triassic and Jurassic) sandstone and limestone formations. In the northern part of the Focus Area, vertical "stovepipe" formations of more resistant sandstones are present, creating spectacular vistas. The highest concentration of these formations is in the Monument Valley area.

The Petrified Forest is another unique geological feature, found near the southern end of the Focus Area near Holbrook. The Petrified Forest is characterized by a large area of mineralized, fossilized trees that have been exposed at the surface by erosion. The only significant part of the Focus Area that is not sedimentary in nature is the Hopi Butte area. This area is characterized by large basalt mesas, formed by a series of low-energy tertiary volcanic flows.

Hydrogeologically, almost all of the surface drainages in the area eventually drain to the Colorado River via the Little Colorado River. Much of the southern part of the Focus Area's surface drainage terminates in closed basins, which connect to the Colorado River only through groundwater connectivity, if at all. Groundwater in the Focus Area is widely variable in depth-to-water, yield capacity, and water quality, and is largely dependent upon local geology and infiltration by seasonal rainfall.

### New River Focus Area

The New River Focus Area includes approximately the southern third of Yavapai County, Arizona. This area is characterized by an irregular line of rugged mountains that exist in a northwest to southeast trending line. These mountains give way to desert lowlands in the southwestern part of the county.

This area is included in the southern part of the Basin and Range physiographic province. This province extends through the intermountain western United States, and is characterized by landforms of long, linear mountain ranges separated by long valleys. These features are the result of extensional tectonic forces, which resulted in normal faulting with downthrown blocks (valleys) and upthrust mountain ranges. In Arizona, the Basin and Range province bends to a northwest – southeast trend due to the narrowing of the North American continent to the south. These tectonic forces are illustrated by the northwest to southeast trending normal faults that exist along the southwest flank of the mountains throughout the study area.

Geologically, the mountain ranges of the New River Focus Area are a complex assortment of Mesozoic granite uplifts, tertiary volcanic basalt flows, and sedimentary rock units. The sedimentary units vary in age depending upon the location; some are older deposits that were deformed by uplift or metamorphism, while others are more recently deposited by erosional forces from the uplifted mountain ranges.

Mining is widespread throughout the area, and includes historic and current mining operations for metals (primarily copper), commodity rock materials (sand and gravel), and decorative stone.

Prominent mountain ranges in the study area include the Mazatzal and New River ranges (east of I-17), the Bradshaw and Weaver Mountains in the central part of the study area (west of I-17 through Crown King and south of Prescott), and the Date Creek Mountains (western part of the Focus Area).

Hydrogeologically, the major surface drainages in the area include the Verde River system (east of I-17), the Agua Fria River system (along and west of I-17), the Hassayampa River system (west central part of the study area) and the Santa Maria River system (far western part of the study area). Groundwater in the study area is widely variable in depth-to-water, yield capacity, and water quality, and is largely dependent upon local geology and infiltration by seasonal rainfall.

## 2.2.2 Hydrological Resources and Issues

This section describes water resources located within the study area including surface water, groundwater, and water basins. Surface waters were identified from reviewing topographic maps. Aquifers were identified from the United State Geological Survey *Groundwater Atlas for the United States* (1995). The major water basins for the Focus Areas were identified from the ADWR website.

### Coconino-Yavapai Focus Area

Perennial streams and rivers in Coconino County include the Colorado River, the Little Colorado River, Oak Creek, the upper portion of West Clear Creek, and East Clear Creek and its tributaries. Other surface waters within the Focus Area include numerous lakes: Lake Powell, Lake Mary, Ashurst Lake, Mormon Lake, and Long Lake. Streams and rivers in